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10/603,462	06/25/2003	Thaddeus Schroeder	DP-306034	3284

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DELPHI TECHNOLOGIES, INC.
M/C 480-410-202
PO BOX 5052
TROY, MI 48007

EXAMINER	
WHITTINGTON, KENNETH	
ART UNIT	**PAPER NUMBER**
2862	

DATE MAILED: 05/26/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/603,462	SCHROEDER ET AL.
	Examiner	Art Unit
	Kenneth J. Whittington	2862

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-45 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-13,16,17,20-29,32-40 and 43-45 is/are rejected.

7)☒ Claim(s) 14,15,18,19,30,31 and 40-42 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 05 June 2003 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Bot Ledynh
Primary Examiner

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 2/9/04.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 19 and 42 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential elements, such omission amounting to a gap between the elements. See MPEP § 2172.01. The omitted elements are: how one of the first set of sensing elements AND one of the second set of sensing elements can each be measuring one of the highest and lowest of the magnetic flux values. Since these claims recite only one target, there can be only one sensing element measuring either the highest or lowest. These claims require two sensors for such measurement. Thus, the claims are missing some feature or method step to indicate how two sensing elements can be the sensor measuring either the highest or lowest voltage.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-3, 7, 8, 17, 23-25, 34, 35 and 39 are rejected under 35 U.S.C. 102(e) as being anticipated by Lequesne et al. (US 2004/0150393). Regarding claims 1 and 23, Lequesne et al. discloses a position sensor comprising:

a linear array of galvanomagnetic sensing elements (See Lequesne et al. FIG. 1, items 16);

a target moving adjacent a surface of the linear array in response to movement of the device, the target shaped so that a magnetic flux density curve resulting from excitation of the sensing elements includes at least one of a peak and a valley (See FIG. 1, item 22 and FIG. 9);

a first circuit for exciting each of the sensing elements (See FIG. 13, items 60 and 62); and

a second circuit for measuring a magnetic flux density value at each of the sensing elements (See FIG. 13, items 64, 66, 68),

wherein each magnetic flux density value is associated with the magnetic flux density curve and wherein at least one of a maximum of the peak and a minimum of the valley indicates one of the linear position and the angular position of the device (See FIGS. 9 and 10).

Regarding claim 2, Lequesne et al. discloses the sensors being magneto-resistive sensors (See page 2, paragraph 0022).

Regarding claim 3, Lequesne et al. discloses the target being a magnetic tooth or slot (See definition of such features at present application, paragraph 0025 and see Lequesne et al. FIGS. 1, 9 and 10, item 22 and note peak in graph).

Regarding claims 7, 8, 34 and 35, Lequesne et al. discloses a voltage or current source biasing the sensors and voltage potential is measured across each sensor representing flux density (See FIG. 13 and paragraphs 0026-0028).

Regarding claims 17 and 39, Lequesne et al. discloses measuring the maximum peak or minimum valley measured at certain sensing elements (See page 3, paragraph 0028).

Regarding claim 24, Lequesne et al. disclose mounting the sensor arrangement in a rack and pinion steering device which requires mounting the target and linear array directly in the device (See page 2, paragraph 0023).

Regarding claim 25, Lequesne et al. discloses connecting a non-magnetic mount to the device and etching or depositing the target onto the nonmagnetic substrate (See page 2, paragraph 0023).

Claims 1, 4, 20, 21, 23 and 44 are rejected under 35 U.S.C. 102(b) as being anticipated by Honda (US 5,327,077). Regarding claims 1 and 23, Honda discloses a rotary or linear position sensor comprising:

a linear array of galvanomagnetic sensing elements (See Honda FIG. 8, items MR1-MR8);

a target moving adjacent a surface of the linear array in response to movement of the device, the target shaped so that a magnetic flux density curve resulting from excitation of the sensing elements includes at least one of a peak and a valley (See FIG. 8, item 3 and col. 4, line 19 to col. 5, line 4);

a first circuit for exciting each of the sensing elements (See FIG. 9, items 6 and 7); and

a second circuit for measuring a magnetic flux density value at each of the sensing elements (See FIG. 9, item 11),

wherein each magnetic flux density value is associated with the magnetic flux density curve and wherein at least one of a maximum of the peak and a minimum of the valley indicates one of

the linear position and the angular position of the device (See col. 4, line 19 to col. 5, line 4 and Summary of the Invention).

Regarding claims 4 and 20, Honda discloses multiple target teeth and the spacing between the teeth is equal to or less than half the distance between the first and last sensor elements (See FIG. 8).

Regarding claims 21 and 44, Honda discloses the apparatus being used to determine linear movement as an alternative to the rotation movement of the apparatus (See Abstract, last sentence), the position being determined based upon the minimums and/or maximums measured in the response signals retrieved from the detector arrays (See col. 4, line 7 to col. 5, line 21, note that the measurement is based upon the minimums and maximums obtained in the sine waves measured by the magnetic sensors).

Claims 1, 5, 23 and 32 are rejected under 35 U.S.C. 102(b) as being ancitipated by Von Borke (US 3,934,160). Regarding claims 1 and 23, Von Borke discloses a linear position sensor comprising:

a linear array of galvanomagnetic sensing elements (See Von Borke FIG. 2, items 4 and 4');

a target moving adjacent a surface of the linear array in response to movement of the device, the target shaped so that a

magnetic flux density curve resulting from excitation of the sensing elements includes at least one of a peak and a valley (See FIG. 2, item 6);

a first circuit for exciting each of the sensing elements (See FIG. 4, note input voltage U); and

a second circuit for measuring a magnetic flux density value at each of the sensing elements (See FIG. 4 and col. 2, line 66 to col. 3, line 7, note circuit measures the change in voltage U_A),

wherein each magnetic flux density value is associated with the magnetic flux density curve and wherein at least one of a maximum of the peak and a minimum of the valley indicates one of the linear position and the angular position of the device (See col. 2, line 66 to col. 3, line 7, note circuit measures the change in voltage U_A to determine the displacement of the target in the x-direction).

Regarding claims 5 and 32, Von Borke discloses the target positioned at an angle to the direction of displacement such that the range of the sensor is equal to a distance between the firs and last sensing element of the linear array divided by the sine of the angle (See FIG. 2, note angle of target 6).

Claims 1, 6, 10, 12, 13, 23, 26, 28, 29, 33 are rejected under 35 U.S.C. 102(b) as being anticipated by Hini (US 4,041,371). Regarding claims 1 and 23, Hini disclose a rotary position sensor comprising:

a linear array of galvanomagnetic sensing elements (See Hini FIG. 1, items 6 and 8);

a target moving adjacent a surface of the linear array in response to movement of the device, the target shaped so that a magnetic flux density curve resulting from excitation of the sensing elements includes at least one of a peak and a valley (See FIG. 1, item 4);

a first circuit for exciting each of the sensing elements (Not shown, but field plates 6 and 8 are energized to monitor changed in voltages therein, see col. 1, lines 41-62 and see col. 2, lines 44-48); and

a second circuit for measuring a magnetic flux density value at each of the sensing elements (See col. 1, lines 41-62 and see col. 2, lines 44-48, note the sensing elements are tapped for a signal),

wherein each magnetic flux density value is associated with the magnetic flux density curve and wherein at least one of a maximum of the peak and a minimum of the valley indicates one of

the linear position and the angular position of the device (See col. 1, lines 41-62 and see col. 2, lines 44-48).

Regarding claims 6, 10, 12, 26, 28 and 33, Hini disclose the spiral shaped target moving in a direction normal to the length of the linear array (See FIG. 1, note orientation of spiral magnetic tooth rotating about axis moving along length of linear array).

Regarding claims 13 and 29, Hini discloses the recited relationship for R(β) because such equation is merely a property of the device disclosed in Hini.

Claims 1, 20, 22, 23, 43 and 45 are rejected under 35 U.S.C. 102(b) as being anticipated by Van Antwerp et al. (US 4,737,710). Regarding claims 1 and 23, Van Antwerp et al. discloses a rotary or linear position sensor comprising:

a linear array of galvanomagnetic sensing elements (See Honda FIGS. 1 and 2, items 12, 14, 16 and 18);

a target moving adjacent a surface of the linear array in response to movement of the device, the target shaped so that a magnetic flux density curve resulting from excitation of the sensing elements includes at least one of a peak and a valley (See FIG. 2, item 48 and FIG. 5);

a first circuit for exciting each of the sensing elements (See FIG. 4A, note bias circuits providing voltage V_R); and

a second circuit for measuring a magnetic flux density value at each of the sensing elements (See FIG. 4A, note most of the circuit shown for such purpose),

wherein each magnetic flux density value is associated with the magnetic flux density curve and wherein at least one of a maximum of the peak and a minimum of the valley indicates one of the linear position and the angular position of the device (See FIGS. 5-8 and col. 2, lines 21-51).

Regarding claims 20 and 43, Van Antwerp et al. discloses multiple spaced magnetic slots (See FIG. 2).

Regarding claims 22 and 45, Van Antwerp et al. discloses the apparatus being used to determine linear movement as an alternative to the rotation movement of the apparatus (See col. 11, lines 61-64), the position being determined based upon the minimums and/or maximums measured in the response signals retrieved from the detector arrays (See col. 5, line 61 to col. 9, line 3).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1, 2, 9, 16, 23 and 26-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rhodes et al. (US 6,509,732) in view of Schroeder (US 6,498,482). Regarding claims 1, 2 and 23, Rhodes et al. teaches a position sensor comprising:

a linear array of magnetic sensing elements (See Rhodes et al. FIG. 1, items 112);

a target moving adjacent a surface of the linear array in response to movement of the device, the target shaped so that a magnetic flux density curve resulting from excitation of the sensing elements includes at least one of a peak and a valley (See FIG. 1, item 106); and

a second circuit for measuring a magnetic flux density value at each of the sensing elements (See FIG. 1, item 103 and col. 3, lines 23-34),

wherein each magnetic flux density value is associated with the magnetic flux density curve and wherein at least one of a maximum of the peak and a minimum of the valley indicates one of the linear position and the angular position of the device (See graph illustrated in FIG. 1).

However, while Rhodes et al. discloses the use of magnetic sensors, it does not teach what particular type. Schroeder teaches using Hall or MR sensors that are excited by an excitation circuit including a current or voltage source (See col. 1, lines 13-29). It would have been obvious at the time the invention was made to use a Hall or MR sensor as taught by Schroeder in the apparatus of Rhodes et al. One having ordinary skill in the art would have been motivated to do so because use of such sensors is well known in the art for measuring magnetic

fields in devices such as linear and rotary position sensors (See same paragraphs of Schroeder).

Regarding claims 9 and 37, the combination teaches of compensating for errors relating to side-offset measurements (See Rhodes et al. col. 3, line 65 to col. 4, line 11).

Regarding claims 16, 36 and 38, the combination teaches fitting the flux density values sensed by the sensors to a function having at least one peak or valley curve indicating the location of the target with respect to the linear array (See Rhodes col. 4, lines 39-47, note that at least two sensor values are interpolated into a response curve).

Claims 11 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hini in view of Yamazaki et al. (EP1003040). Hini does not teach specifically of and eccentricity compensation means. Yamazaki et al. teaches an rotary sensor with means to compensate for eccentricity of the rotor with respect to the stator (See Yamazaki et al. col. 2, paragraph 0007). It would have been obvious at the time the invention was made to incorporate the means to compensate as taught by Yamazaki et al. into the apparatus of Hini. One having ordinary skill in the art would have been motivated to do

so to prevent output variation whenever the rotor becomes off center during rotation (See same paragraph of Yamazaki et al.).

Allowable Subject Matter

Claims 14, 15, 18, 19, 30, 31, 40, 41 and 42 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Furthermore, the 112 rejections to claims 19 and 42 would also have to be overcome for those claims to be allowable.

The following is a statement of reasons for the indication of allowable subject matter:

Regarding claims 14 and 30, the prior art does not disclose an annular magnetic strip concentric with the axis of rotation in addition to the spiral magnetic strip, in combination with the other features of the claims. Regarding claims 15 and 31, based on their dependency to claims 14 and 30, have allowable subject matter for the same reasons.

Regarding claims 18 and 40, while the prior art does illustrate parabolic curve fitting, the prior art does not disclose determining a highest/lowest voltage among the sensors, sequentially numbering three adjacent sensors including the sensor with the highest/lowest voltage, and applying parabolic

curve fitting techniques to determine the location of the target using the equation recited in the claims, in combination with the other features of the claims. Regarding claim 41, based on its dependency to claim 40, has allowable subject matter for the same reasons.

Regarding claims 19 and 42, as is best understood, while the prior art does illustrate parabolic curve fitting, the prior art does not disclose determining a highest/lowest voltage among the sensors, sequentially numbering a first and second set of three adjacent sensors including the sensor with the highest/lowest voltage, and applying parabolic curve fitting techniques to determine the location of the target and averaging the results from the first and second sets of sensors to determine the location of the target using the equation recited in the claims, in combination with the other features of the claims.

Conclusion

The prior art made of record in the PTO-892 and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kenneth J. Whittington whose telephone number is (571) 272-2264. The

examiner can normally be reached on Monday-Friday, 7:30am-4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Lefkowitz can be reached on (571) 272-2180. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Kenneth J Whittington
Examiner
Art Unit 2862

kjw